PARTITION WALL ELEMENT

Description

[0001] The invention is directed to a motor-driven element of a partition wall or dividing wall, particularly a horizontally sliding wall, with at least one motor-driven closure profile according to the preamble of claim 1.

[0002] Mobile dividing walls with closure profiles are sufficiently well known and are described, e.g., in DE 199 07 232 A1 and DE 199 07 242 A1. In these references, closure elements are provided in wall elements of a dividing wall that are suspended from a track and these closure elements can be braced between the floor and ceiling. In this case, pressing of the closure profiles against the floor and ceiling is carried out in a mechanical manner when locking the mobile dividing wall. Lifting members which are arranged in the wall elements are swiveled by means of a horizontal displacement of these wall elements so that the closure profiles which are provided with sealing strips are pressed into position.

[0003] Further, there are also known dividing wall elements 1 which are described in DE 24 04 875 B2 and shown in Figure 5. In addition to a drive motor, not shown, for moving the elements, these dividing wall elements 1 have a second motor M2 which can move scissors 3 open and closed by means of a spindle 2 so that upper and lower closure profiles 5 can be pressed against the floor and ceiling and released again, i.e., can be brought into a moved out end position and a moved in end position, by lifting rods 4. In this case, providing the second motor M2 means an increase in voltage supply rails and/or control channels by which the dividing wall element 1 is controlled and supplied with energy, as well as a doubling of expenditure on control electronics, since twice the number of motors must now be controlled.

[0004] Therefore, it is the object of the present invention to provide a motor-driven element of a dividing wall having at least one motor-driven closure profile, in which additional expenditure on controls for the motor-driven closure profile is as low as possible or nonexistent, particularly with respect to the voltage supply rails, control lines and a control device for the mobile dividing wall.

[0005] This object is met by the features indicated in patent claim 1 for a motor-driven element of a dividing wall having at least one motor-driven closure profile. Advantageous developments of the subject matter of patent claim 1 follow from the subclaims.

[0006] By means of the switching apparatus, indicated in patent claim 1, which is arranged in an element, the control carried out for controlling the motor that is provided for moving the element need not be converted or modified, and the second motor for driving the at least one closure profile does not need its own control but rather is controlled automatically by the control provided for moving the element.

[0007] The switching apparatus has a first sensor for determining the end position (closed wall) of the element. This sensor can be a mechanical sensor or an electronic sensor and ensures that the switching apparatus can correctly switch the supplied energy after the end position has been reached.

[0008] Further, the switching apparatus has a second sensor for determining an end position of the at least one moved in closure profile. This sensor can also be mechanical or electronic.

[0009] Further, the element preferably has a first motor for driving the element and a second motor for driving the at least one closure profile. The switching apparatus switches the voltage applied to the element for moving the element in the end position of the element between the first motor and the second motor in such a way that the second motor moves the at least one closure profile out after the element reaches its end position and moves it in before the element exits its end position.

[0010] According to a preferred construction of the invention, the switching apparatus is preferably switched between a first voltage supply connection of the element and a first connection of the first motor and of the second motor, respectively, wherein a second connection of the first motor and of the second motor, respectively, is connected to a second voltage supply connection of the element.

[0011] Further, the voltage applied to the element via the first voltage supply connection and the second voltage supply connection has a first polarity direction for moving the element into the end position and a second polarity direction, which is the reverse of the first polarity direction, for moving the element out of the end position.

[0012] Through this kind of construction of the element according to the invention and further preferable constructions, the control, including the voltage supply bars, provided for moving the element can be used without modification for automatic (parallel) control of the second motor provided for driving the at least one closure profile, and a switching apparatus which is constructed using few component parts can be achieved at the same time, since a defined switching which is always identical can be carried out after the end position is reached and before the end position is exited.

[0013] The first sensor advantageously has a switch whose switchable connection is connected to the first voltage supply connection, whose first fixed connection is connected to the first connection of the first motor, and whose second fixed connection is connected to the first connection of the second motor by a first diode. The switch connects the switchable connection to the second fixed connection in the end position and connects it to the first fixed connection in a parked position.

[0014] The second sensor advantageously has a dual switch whose first switching path is connected parallel to the first diode and bypasses the first diode when the closure profile is in a moved in end position and whose second switching path is connected parallel to the switch in a series connection with a second diode and bypasses the switch when the closure profile is not in a moved in end position.

[0015] This results in a particularly ingenious switching apparatus which does not need to be controlled by a microprocessor or by a complicated logic circuit, but makes do with two preferably mechanical switches and two diodes. This switching apparatus according to the invention is suitable for all common control devices for the first motor that is provided for driving the element, particularly also for those in which the supply of energy to the element is switched off depending upon the power consumed by the element. This also includes the case in which the element is not connected to the current or voltage supply rails directly but rather via a control device which can also be arranged in the element of the dividing wall. As used in the preceding and in the following description, the supply of energy to the element or the voltage applied to the element refers to the voltage applied to the first motor that is provided for driving the element, i.e., for moving the element.

[0016] Further details, features and advantages of the invention are indicated in the following description of preferred embodiment examples with reference to the drawings.

[0017] Figure 1 shows a flowchart of the process sequence for closing an element of a dividing wall, i.e., the movement of the element of the dividing wall into the end position, according to a preferred first embodiment form of the invention;

Figure 2 shows a flowchart of the process sequence for opening an element of a dividing wall, i.e., the movement of the element of the dividing wall into the parked position, according to the first embodiment form according to the invention;

Figures 3a-3d show four different states of the switching apparatus in the first preferred embodiment form according to the invention;

Figure 4 shows a flowchart of the process sequence showing the opening and closing of an element of a dividing wall according to a second preferred embodiment form of the invention; and

Figure 5 shows dividing wall elements according to the prior art.

[0018] Figure 1 shows the process sequence for closing an element of a dividing wall according to a first preferred embodiment form of the invention. After the element 1 has been started in a first step S1, wherein a drive motor of the element 1 that moves the element 1, e.g., out of its parked position into its end position, is supplied with energy, it is checked in a second step S2 whether or not the element 1 is already in the end position. If this is not the case, the second step S2 is carried out again in a "monitoring loop". If the element 1 is located in the end position, the supply voltage of the drive motor of the element 1 is switched in a third step S3 to a pressing motor that moves the at least one closure profile 5 of the element 1 outward, i.e., toward the ceiling and floor, this closure profile 5 preferably being provided with sealing strips. In a fourth step S4, it is checked whether or not the at least one closure profile 5 has reached its end position. If not, the fourth step S4 is carried out again in a monitoring loop. When the at least one closure profile 5 is in the end position, the closing of the element 1 is concluded in a fifth step S5.

[0019] When the monitoring of the end position of the element 1 is carried out normally, i.e., without the additional pressing, according to the invention, of the closure profile, e.g., by means of monitoring the power consumed by the drive motor of the element 1, the supply voltage need only be switched in a suitable manner from the drive motor to the pressing motor, e.g., by means of a mechanical end position detector, so that the element 1 is closed according to the invention, i.e., by pressing the at least one closure profile 5. After this, the "normal" control now monitors the pressing motor in step S4 and switches it off when the power consumption increases as a result of a blocking of the motor, because the end position of the at least one closure profile 5 is then reached. This assumes either that the drive motor of the element 1 and the pressing motor consume an approximately equal amount of current when blocking or that the control device is adapted to the power requirement of the pressing motor. Naturally, switching can also be achieved in some other way than by means of a mechanical end position switch for the element 1.

[0020] Only a power supply with a control part or output part is needed for the procedure described above. The drive motor and the pressing motor are accordingly fed by the same power consumer.

[0021] Figure 2 shows the process sequence for opening an element 1 of a dividing wall according to the first preferred embodiment form. After the opening of the element 1 is started in a sixth step S6 in that voltage which was previously reversed in polarity and applied to the pressing motor is supplied to the element 1, it is checked in a seventh step S7 whether or not the at least one closure profile 5 is in a moved in end position. If this is not the case, the seventh step S7 is repeated in a monitoring loop. If it is the case, the pressing motor is switched off in an eighth step S8 and the supply voltage is switched to the drive motor of the element 1 in a ninth step S9. The eighth step S8 and the ninth step S9 can also be combined. In a tenth step S10, it is checked whether the element 1 of the dividing wall is still moving or is located in a parked position. If the element 1 is still moving, the tenth step S10 is repeated in a monitoring loop. If the element 1 is no longer moving, i.e., the element 1 is in a parked position, e.g., moved against a stop, the drive motor of the element 1 is switched off in an eleventh step S11 before the opening of the dividing wall element has ended in a twelfth step S12.

[0022] Figures 3a-3d show a switching apparatus according to the invention which operates according to a first preferred embodiment form of the invention, i.e., according to the flowchart shown in Figures 1 and 2. The switching apparatus according to the invention is switched between a first voltage supply connection 6 of the element 1 and a first connection of the first motor M1 and of the second motor M2, respectively. The respective second connections of the first motor M1 and of the second motor M2 are connected together and connected to a second voltage supply connection 7 of the element 1. As was already mentioned, the voltage supply connections of element 1 can also be internal voltage connections of element 1, e.g., when a control device is arranged in the element 1. In this case, these connections supply the supply voltage of the first motor M1, i.e., of the drive motor of the element 1. The switching apparatus is constructed in such a way that a switchable connection 8 of a switch ES2 is connected to the first voltage supply connection 6 whose first fixed connection is connected to the first connection of the drive motor M1 and whose second fixed connection 10 is connected to the first connection of the second motor M2, i.e., the pressing motor, by a diode D1. The anode of the diode D1 is connected to the second fixed connection 10 of the switch ES2 and the cathode of the diode D1 is connected to the first connection of the pressing motor M2. Further, the switching apparatus has a dual switch ES1 whose first switching path 11 is connected parallel to the diode D1 and whose second switching path 12 is connected in series with a diode D2 parallel to the switchable connection 8 and first fixed connection 9 of the switch ES2. The anode of the diode D2 is

connected via the second switching path of the dual switch ES1 to the first fixed connection 9 of the switch ES2 and the cathode of the diode D2 is connected to the switchable connection 8 of the switch ES2. Naturally, as an alternative, the diode D2 can also be connected with the same polarity between the second switching path 12 of the dual switch ES1 and the first fixed connection 9 of the switch ES2.

[0023] Figure 3a shows a state of the switch ES2 and of the dual switch ES1 in which the element 1 is in a parked position, i.e., in a state such as that existing prior to the first step S1 shown in Figure 1. In this state, the switchable connection 8 of the switch ES2 is connected to the first fixed connection 9 of the switch ES2, the first switching path 11 of the dual switch ES2 is open, and the second switching path 12 of the dual switch ES1 is closed. When the element 1 is started, i.e., the first step S1 shown in Figure 1 is carried out, a voltage is applied to the voltage supply connections such that the first voltage supply connection 6 obtains the positive voltage and the second voltage supply connection 7 is connected to ground. With these potential relationships, the diode D2 blocks and the drive motor S1 is switched by the switch ES2 between the ground connected to the second voltage supply connection 7 and the positive potential applied to the first voltage supply connection 6, so that this rotates in a first direction which moves the element 1 into a closing position of the dividing wall.

[0024] When the end position is reached, the switch ES2 is switched in such a way that the switchable connection 8 is connected to the second fixed connection 10 as is shown in Figure 3b. The potential distribution to the voltage supply connections remains the same. Accordingly, the drive motor M1 is no longer at positive potential, i.e., it is switched off, and the pressing motor M2 lies between positive potential and ground across the diode D1 which is polarized in the conducting direction. The pressing motor M2 therefore rotates in a first direction so that the at least one closure profile 5 is moved out and the element 1 is accordingly pressed, e.g., toward the floor and ceiling. As soon as the at least one closure profile 5 is no longer in its moved in end position, i.e., shortly after the pressing motor M2 starts, the two switching paths of the dual switch ES1 are reversed, i.e., the first switching path 11 is closed and the second switching path 12 is opened. As soon as the at least one closure profile 5 is moved out, i.e., the element of the dividing wall is pressed, the voltage supply connections are no longer supplied with voltage so that the pressing motor M2 is switched off. This interruption of the supply voltage is carried out by means of a control, not shown, which is used in a conventional manner as a direct control for the drive motor M1 where the drive motor M1 would be directly connected between the first voltage supply

connection 6 and the second voltage supply connection 7 of the element 1. The fifth step S5 shown in Figure 1 is now reached.

[0025] Figure 3c shows the above-described state of the switch ES2 and of the dual switch ES1 in the fifth step S5 shown in Figure 1 and in the sixth step S6 shown in Figure 2, i.e., in a state in which the element 1 of the dividing wall is in the end position and the at least one closure profile 5 is pressed. If the element 1 is to be opened, i.e., the sixth step S6 shown in Figure 2 is to be carried out, the first voltage supply connection 6 is grounded and a positive potential is applied to the second voltage supply connection 7. The pressing motor 2 accordingly lies between positive potential and ground, the connection to ground being carried out by means of the switch ES2 and the first switching path 11 of the dual switch ES1. Since a reversal of polarity of the pressing motor M2 has taken place in the state shown in Figure 3b, the pressing motor M2 now rotates in a second direction which is opposite to the first direction, so that the at least one closure profile 5 is moved in. As soon as the at least one moved in closure profile 5 is in an end position, the switching paths of the dual switch ES1 are reversed, i.e., the first switching path 11 is opened and the second switching path 12 is closed as is shown in Figure 3d. The pressing motor M2 is accordingly switched off because the diode D1 lying parallel to the first switching path 11 of the dual switch ES1 blocks with this potential distribution. Further, the drive motor M1 is accordingly connected because the diode D2 lies in the conducting direction with this potential distribution. The polarity of the drive motor M1 is reversed with respect to the state shown in Figure 3a, so that it runs in a second rotating direction opposed to the first rotating direction and the element 1 of the dividing wall accordingly moves out of the end position into a parked position. When this parked position is reached, the switch ES2 is switched over and subsequently, e.g., because of the increased current draw of the driving motor M2, the supply voltage applied to the voltage supply connections is switched off. The twelfth step S12 shown in Figure 2 is now reached and the switch and dual switch of the switching apparatus are again in the state shown in Figure 3a.

[0026] By means of a corresponding control, a dividing wall element 1 can also be in an end position before it moves toward another dividing wall element 1 or toward another stop, i.e., the switch ES2 can be switched so as to be controlled differently. The at least one closure profile 5 also need not necessarily or exclusively be pressed against the floor and ceiling; naturally, pressing in horizontal direction is also possible.

[0027] Figure 4 shows a method for controlling a dividing wall element 1 according to a second preferred embodiment form of the invention. In a thirteenth step S13, the dividing

wall element 1 is started by applying a supply voltage. In a fourteenth step S14, it is checked whether or not the closure profile 5, which is preferably provided with a sealing lip in all of the embodiment forms of the invention, is located in an open end position, that is, is completely moved in. If this is not the case, i.e., the dividing wall element 1 is pressed, the closure profile 5 is moved in in a fifteenth step S15, i.e., the pressing is canceled, e.g., a sealing strip is moved open, whereupon the fourteenth step S14 is carried out again in that it is checked whether or not the closure profile 5 is completely moved in, i.e., that there is no longer any pressing, e.g., a sealing strip is completely open. If this is the case, the pressing motor M2 is stopped in a sixteenth step S16 and it is checked in a seventeenth step S17 whether or not the dividing wall element 1 is to be moved open or shut, that is, e.g., brought into the parked position or into the end position. If the element 1 is to be moved open, that is, e.g., brought into the parked position, the drive motor M1 of the element 1 is provided with current in an eighteenth step S18 by the switching apparatus in such a way that the element 1 moves in the open direction, i.e., in the direction of the parked position. In a subsequent nineteenth step S19, it is checked whether or not the dividing wall element 1 is located in the desired position, e.g., in the parked position, i.e., in the "open" end position. If this is not the case, step S18 is carried out again. If it is the case, the drive motor M1 is turned off in a twentieth step S20. However, if the dividing wall element is not to be moved open but rather, e.g., moved out of the parked position into an end position, then, after the seventeenth step S17, a twenty-first step S21 is carried out in which the dividing wall element 1 is allowed to move in the closed direction by a corresponding control. After the twenty-first step S21, it is checked in a twenty-second step S22 whether or not the dividing wall element 1 is in an end position, that is, for example, in a closed end position. If this is not the case, the twenty-first step S21 is carried out again, i.e., the dividing wall element 1 moves farther in the closing direction. If it is the case, the twentieth step S20 is carried out and the drive motor is switched off.

[0028] After the drive motor M1 is switched off in the twentieth step S20, the pressing motor M2 is controlled by the switching apparatus according to the invention in a twenty-third step S23 in such a way that the at least one closure profile 5 closes, i.e., the dividing wall element 1 is pressed. In a subsequent twenty-fourth step S24, it is checked whether the at least one closure profile 5 is completely moved out. If this is not the case, step S23 is carried out again. If it is the case, the pressing motor M2 is switched off in a subsequent step S25, whereupon the process is concluded in a twenty-sixth step S26.

[0029] Accordingly, in contrast to the first embodiment example of the invention, the dividing wall element 1 according to the second preferred embodiment form of the invention is always pressed in the stationary state, that is, for example, also in the parked position.

[0030] The preceding description of the embodiment examples according to the present invention serves only to illustrate and not to limit the invention. Various changes and modifications are possible within the framework of the invention without departing from the scope of the invention and its equivalents.

[0031] Reference Numbers

1	dividing wall element
2	spindle
3	scissors
4	lifting rods
5	closure profile
M1	first motor, drive motor
M2	second motor, pressing motor
D1	diode
D2	diode
ES1	dual switch
ES2	switch
6	first voltage supply connection of the dividing wall element
7	second voltage supply connection of the dividing wall element
8	switchable connection of the switch ES2
9	first fixed connection of the switch ES2
10	second fixed connection of the switch ES2
11	first switching path of the dual switch ES1
12	second switching path of the dual switch ES2